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ART. IV.—*A Noteworthy Specimen of Spaniodon elongatus Pictet from the Upper Cretaceous of Mount Lebanon, Syria.*

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In the Museum of the Geology Department at the University of Melbourne, there is preserved a specimen (Register Number 833) of *Spaniodon elongatus* Pictet, from the Upper Cretaceous chalk of Mt. Lebanon, which is remarkable in that the remains of another small fish are preserved in the abdominal region of the *Spaniodon*, and that what appears to be the contents of part of the intestinal tube are also fossilised.

DESCRIPTION.—The *Spaniodon* individual is lying on its right side in fine grained chalk, and many of the bones are preserved intact, while others have fallen away from the rock. The body outline of the fish is clearly defined, for between the bones there is a thin deposit of brownish material underlain by a flesh-coloured substance, and where the brown film has flaked off, the underlying flesh-coloured matter remains. The size of the fish, and the width of the body relative to the length of the head and opercles, indicate that the individual is referable to *Spaniodon elongatus* Pictet, but it should be noted that the vertebral centra are not more noticeably elongated than in *S. blondeli*. The fish is fractured along a small fault, the posterior part having been displaced relatively to the anterior by about 2 mm. in a dorsal sense, and about 1 mm. to the left (upwards in the specimen). The fracture is not visible in the matrix. The vertebral column is bent, the flexure occurring in the region of the 14th, 15th and 16th abdominal vertebrae, and near the middle of the abdominal cavity the remains of a small fish are to be seen, showing the impressions of seventeen caudal vertebrae with neural and haemal spines, and a relatively long caudal fin, the latter pointing towards the head of the large fish (see Plate II.). The small fish lies over the abdominal ribs of the right side of the large individual, but it is not clear whether the abdominal ribs of the left side of the large fish overlie the small individual or not. The left counterpart of the specimen is not available, and the state of preservation does not enable each rib preserved to be definitely identified as right or left, but in one place, what are presumed to be left ribs do appear to overlie parts of the small fish (near the fracture). It is, in any case, extremely unlikely that the small individual should be external to the large, as it would almost certainly have rolled off the latter before fossilisation, especially as the two fishes are parallel. There is no trace of matrix between the two, and only the posterior part of the small fish is preserved. It is, therefore, highly probable that this small individual represents a small fish swallowed by the larger, and

now lying in its stomach, the anterior parts of the small fish, which is perhaps a young *Spaniodon*, having been digested. In contact with the disintegrated anterior end of the small fish, is a solid mass of brownish material of irregularly vermicular form, which in all probability represents the contents of the loosely coiled alimentary canal, posterior to the pylorus.

Microchemical tests were carried out on various parts of the fossil, and it was found that all the substances preserved, viz., bone, brown film, flesh-coloured film, and contents of the alimentary canal, are phosphatic, crystals of ammonium phosphomolybdate being precipitated on adding excess ammonium molybdate solution to a nitric acid digest of the substance tested. The chalk matrix is non-phosphatic, and it is therefore most probable that the phosphatic material is all of organic origin, so that this test serves to indicate the probable organic derivation of the material of the presumed alimentary canal, in which minute bone fragments are visible near the partially digested fish.

REMARKS.—If the interpretation of the specimen given above be correct, we may conclude that *Spaniodon elongatus* was, occasionally at least, a fish-eater. This is also indicated by the presence of a few large teeth at the anterior end of the jaws, and it is clear that the feeding habits of the fish were quite different from those of the herring-like fishes with which it has been associated taxonomically by Boulenger (1907). Boulenger included *Spaniodon* in a subfamily of the Clupeidae along with such forms as *Engraulis* (the anchovy), *Dussumeria*, *Etrumeus*, and other similar forms, all feeding, as a rule, upon plankton. I believe, however, that such a distinct difference between the feeding habits of these fishes and of *Spaniodon* should exclude the latter from the subfamily in which these fishes are united, although its feeding habits alone would not exclude *Spaniodon* from the family Clupeidae.

The stomach, in which the small fish lies undistorted, seems to have been a simple sac. It must have been divided off from the intestinal tube by a pyloric constriction, provided, in all probability, with a pyloric sphincter muscle, as is indicated by the disintegration of the small fish at the pylorus.

The intestinal tube was relatively small and straight, with only a few small loops. In *Thrissopater intestinalis* Moodie (1910), as is shown in a specimen from the Cretaceous of Texas, there was a large rectum, preceding which was an intestine with six large coils, but no trace of similar structures is preserved in the specimen of *Spaniodon* under consideration. It is indeed probable that the intestine was not coiled in the manner Moodie describes for *Thrissopater*, but rather that the arrangement was simple, with a sac-like stomach and a relatively straight intestine, as in many predaceous fishes.

A further point of interest regarding this fish is the flexure of the vertebral column. Similar distortions are not uncommon in living fishes, and Edinger (1932) has figured two examples in fossil forms. The possible causes are many, including mechanical injuries, the action of parasites, abnormal chemical composition of the water, and faulty diet. The cause of the flexure exhibited by the specimen under consideration is not known.

CONCLUSION.—The specimen described above is unique among fossil fishes whose stomach contents are preserved, in that the food was not completely macerated before fossilisation occurred. It recalls to mind the specimen of *Undina* described by Watson (1927), in which two unborn embryos are present in the oviducts, but there is little possibility that the present example could be due to viviparity in *Spaniodon*, which is a typical teleost. In viviparous teleosts there are numerous embryos which lie free in the body cavity of the mother. It is peculiar that the small fish in the stomach of the *Spaniodon* should not be surrounded by macerated material similar to that in the intestinal tube, and I cannot account for the absence of such material. Nevertheless it is difficult to find any more probable interpretation of the fossil than that given above.

References.

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Explanation of Plate.

Spaniodon elongatus Pictet, Upper Cretaceous, Mount Lebanon, Syria. Photograph and sketch (somewhat diagrammatic) $\times 3/4$, showing a small fish (*fr*) lying in the stomach of the *Spaniodon*. The latter is fractured at *f*, and exhibits a flexure of the vertebral column at *fl*. The contents of the intestinal tube are preserved at *i*.

